December 16, 2024

Flood Resiliency Blueprint – December PAG Meeting

North Carolina Flood Resiliency Blueprint

- Introduction

- Phase II – Feedback and Progress
  - Modeling plan
    - Status of modeling
    - Future Scenarios
  - Blueprint Tool
    - Testing and Feedback
    - Methodology meeting
- Phase III (2024 - 2025)
  - River Basin Action Strategies
- Implementation Strategy
- Future of the Blueprint

Aaron Nelsen/Citizen Times / USA Today

Blueprint Overview

- **Phase I** (2022 - 2024) *Complete*
  - Research and evaluation, gap analysis, recommendations and decisions (Programmatic, Policy, Tools, Approaches, Needs),
  - Draft Neuse River Basin Action Strategy (Pilot)
  - Draft Blueprint
- **Phase II** (2023 - 2025) - *Ongoing*
  - Model improvement
  - Develop online decision support tool (Blueprint Tool)
- **Phase III** (2024 - 2026) - *Ongoing*
  - Develop Action Strategies for five prioritized areas
  - Refine Blueprint and Neuse Action Strategy (including additional data)
  - Refine Decision Support Tool
  - Additional River Basin Action Strategies as funding allows
- **Implementation** – (2024-____) *Ongoing*

Blueprint - Phase II

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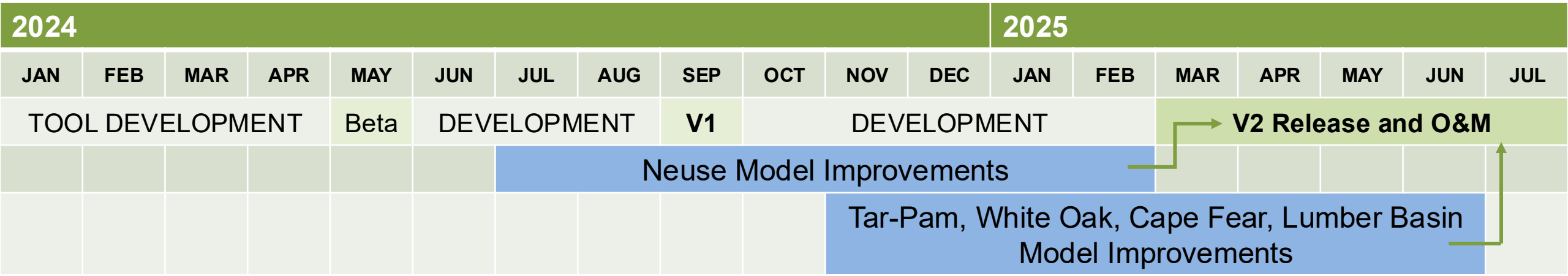
Phase II – Modeling and Tool Development

Tool Development and **Model Improvement**

- April 2024 - Beta Testing
- September 2024 – Version 1 - *Testing*
- Spring 2025 – Version 2 - *Public*

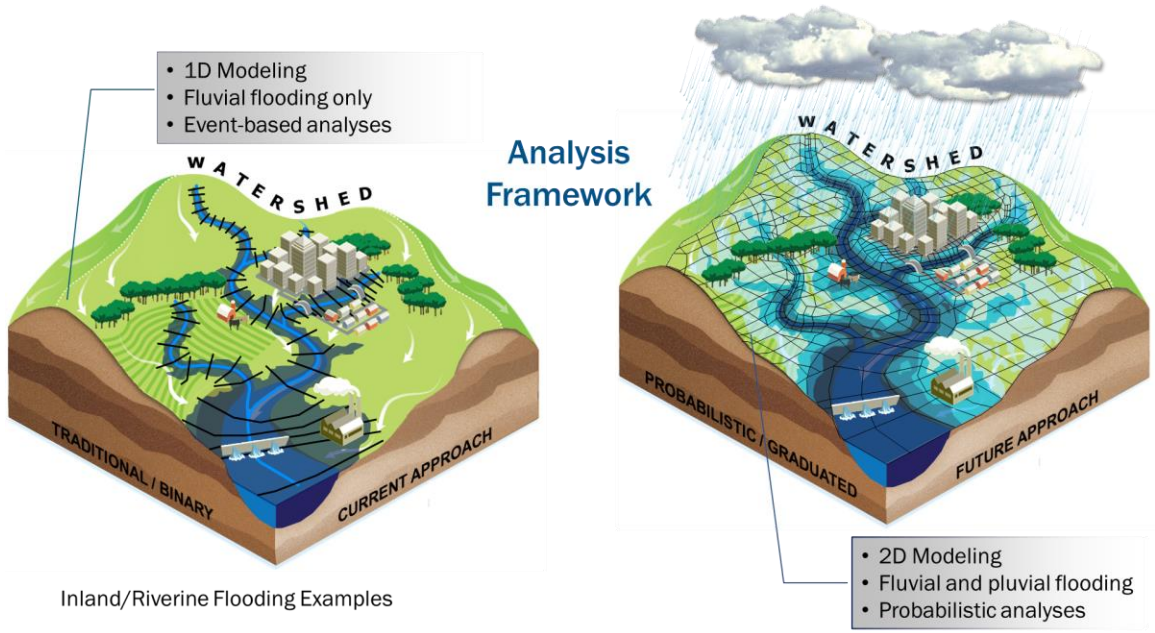


Phase II – Modeling Strategy

Better define flood extent and depths

- Current Conditions
- Capture *future* flooding
  - Changes in precipitation patterns
  - Sea level rise
  - Increased impervious surfaces
- Facilitate future improvements
  - Storm surge and compound flooding

Support tool functionality



Inland/Riverine Flooding Examples

Phase II – Modeling Schedule

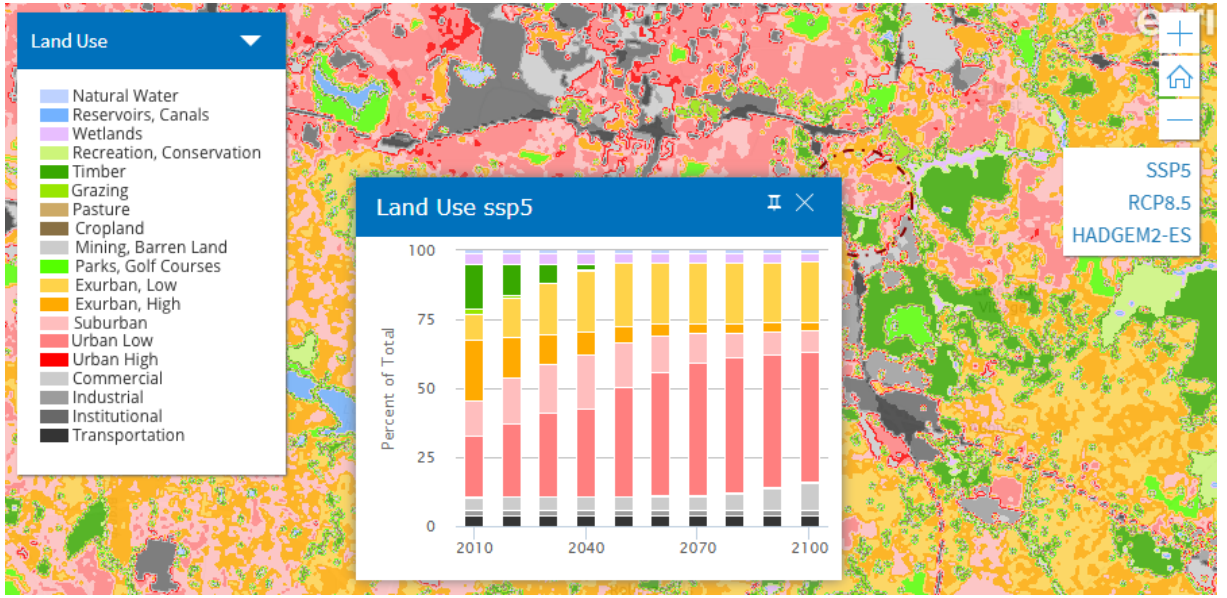
	Item	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26
MODELING	Neuse Modeling															
	Cape Fear Modeling															
	Lumber Modeling															
	Tar Pamlico Modeling															
	White Oak Modeling															
	FB LIDAR collection/processing															
	French Broad Modeling															

Modeling Scenarios

Simulation	Scenario	Number
Existing condition	20%, 10%, 4%, 2%, 1%, 1%-plus, 0.5%, 0.2% and 0.1% annual-chance storm events	9
Buildout w/o climate	1% ICLUS 2050 and 1% ICLUS 2100	2
Climate with buildout	1% Mid Century low/high, 1% End Century low/high/severe	5

Buildout – Based on Integrated Climate and Land Use Scenarios (ICLUS) projections.

https://iclus.epa.gov/



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Future Scenarios – Climate and Buildout

Scenario	HEC Runs				Surge Calculations		
			SLR Boundary Conditions		1% AEP Storm Surge Adjustment (SLR+Subsidence)		
	Precip Scenario	Buildout Scenario	Year, SSP, % of range	SL adjustment 2010 - scenario year (+ feet)	Year, SSP, % of range	SL adjustment 2010 to scenario year (+ feet)	Subsidence adjustment
Mid Century Lower	Y2050, RCP4.5 50%	ICLUS 2050 RCP4.5	Y2050, SSP4.5 50%	0.74	Y2050, SSP4.5 50%	0.74	VLM Surface 2050
Mid Century Higher	Y2050, RCP4.5 90%	ICLUS 2050 RCP4.5	Y2050, SSP4.5 83%	1.07	Y2050, SSP4.5 83%	1.07	VLM Surface 2050
End of Century Lower	Y2100, RCP4.5 50%	ICLUS 2100 RCP8.5	Y2100, SSP4.5 50%	1.89	Y2100, SSP4.5 50%	1.89	VLM Surface 2100
End of Century Higher	Y2100, RCP8.5 90%	ICLUS 2100 RCP8.5	Y2100, SSP8.5 50%	2.58	Y2100, SSP8.5 50%	2.58	VLM Surface 2100
End Of Century Severe	Y2100, RCP8.5 90%	ICLUS 2100 RCP8.5	Y2100, SSP8.5 83%	3.59	Y2100, SSP8.5 83%	3.59	VLM Surface 2100

Data Sources:

- NC State Climate Office / NCDOT (Atlas 14 Adjustments)
- ICLUS v2 EPA
- AR6 Models IPCC
- NC CORS

Modeling Outputs

What will we see in the tool?

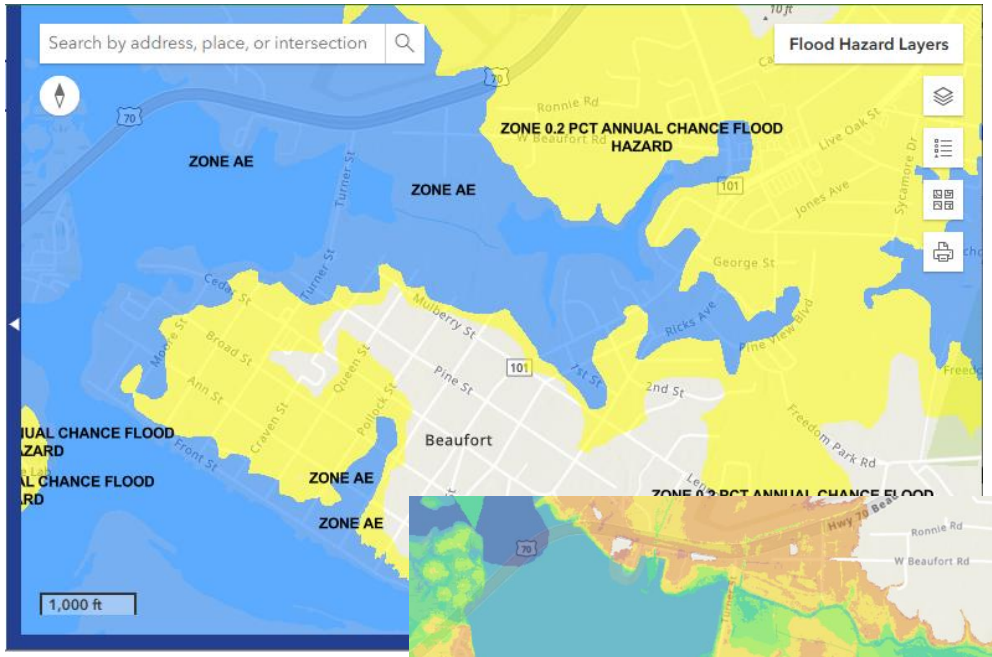
- **Flood Hazard Areas**
- **Existing Conditions** - Percent Annual Chance Flood Extent and Flood Depth

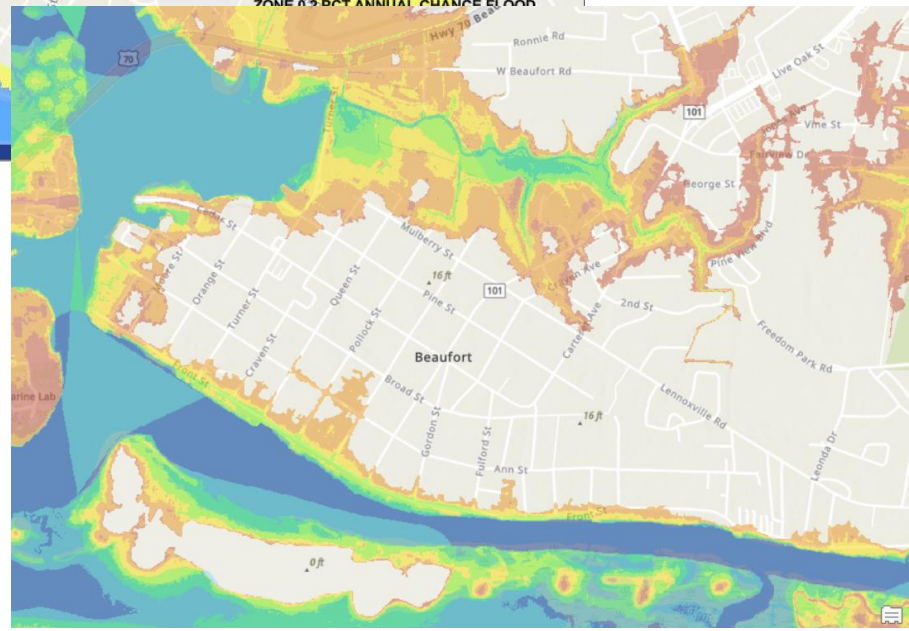
20%	10%	4%	2%	1%	0.5%	0.2%	0.1%

- **Future Conditions** 1% Annual Chance

Mid Century (2050)		
Lower Scenario	Higher Scenario	Buildout Only

End of Century (2100)			
Lower Scenario	Higher Scenario	Severe Scenario	Buildout Only





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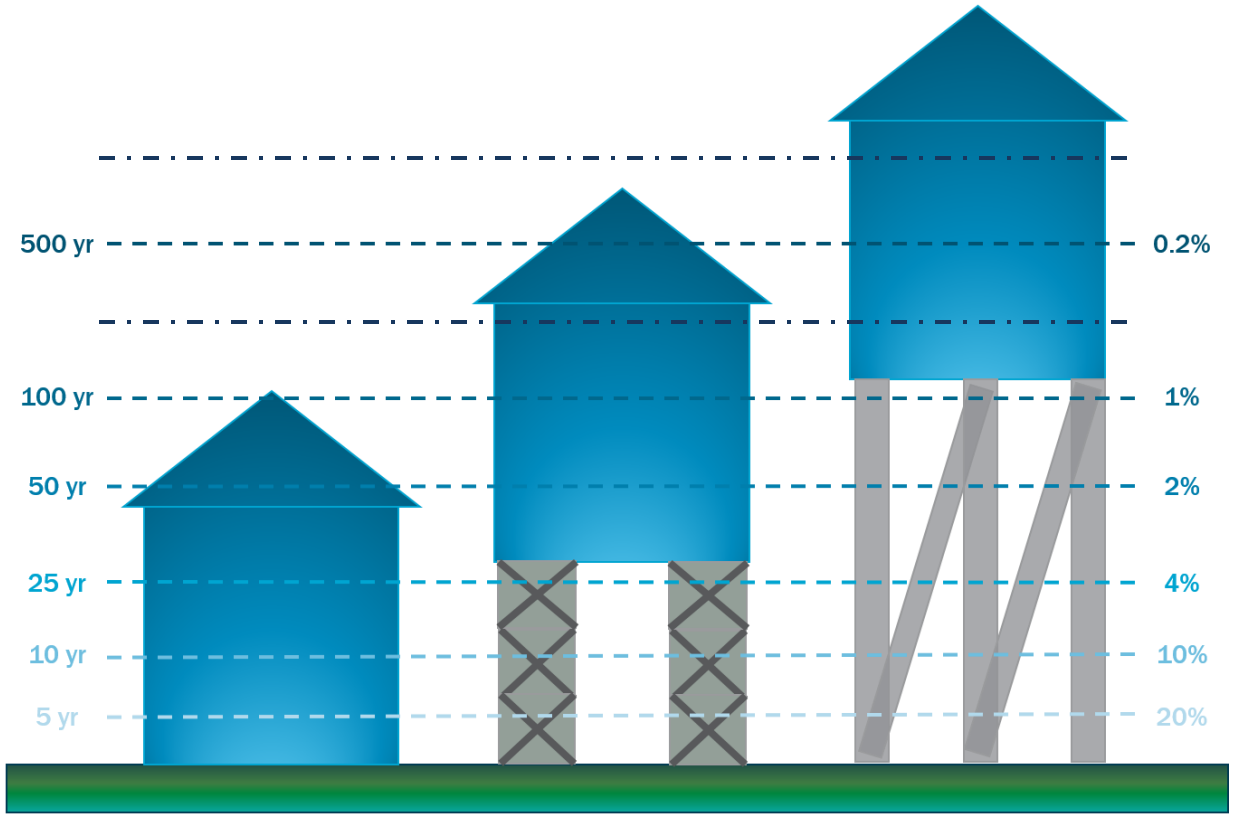
Modeling Outputs

What will we see in the tool?

- **Current Conditions** - Percent Annual Chance Flood Extent and Flood Depth

20%	10%	4%	2%	1%	0.5%	0.2%	0.1%



Variable flood depths and associated damage estimates for structures of varying elevation levels.

Modeling Outputs

What will we see in the tool?

- **Future Conditions** 1% Annual Chance

Mid Century (2050)		
Lower Scenario	Higher Scenario	Buildout Only

End of Century (2100)			
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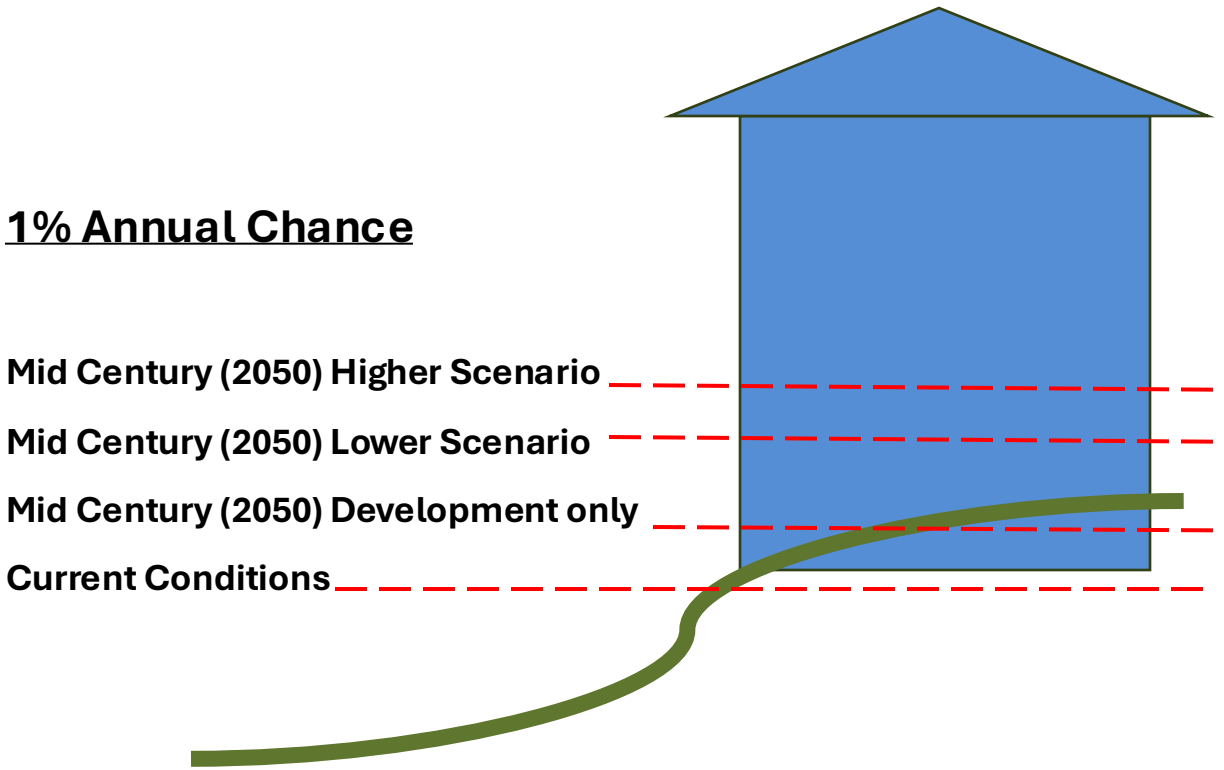

Modeling Outputs

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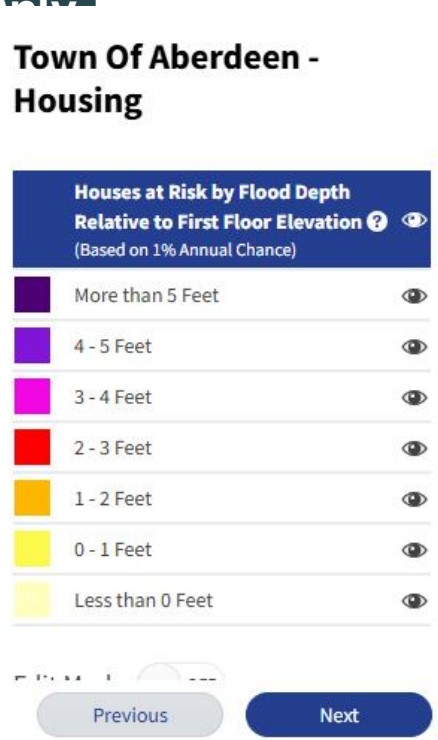

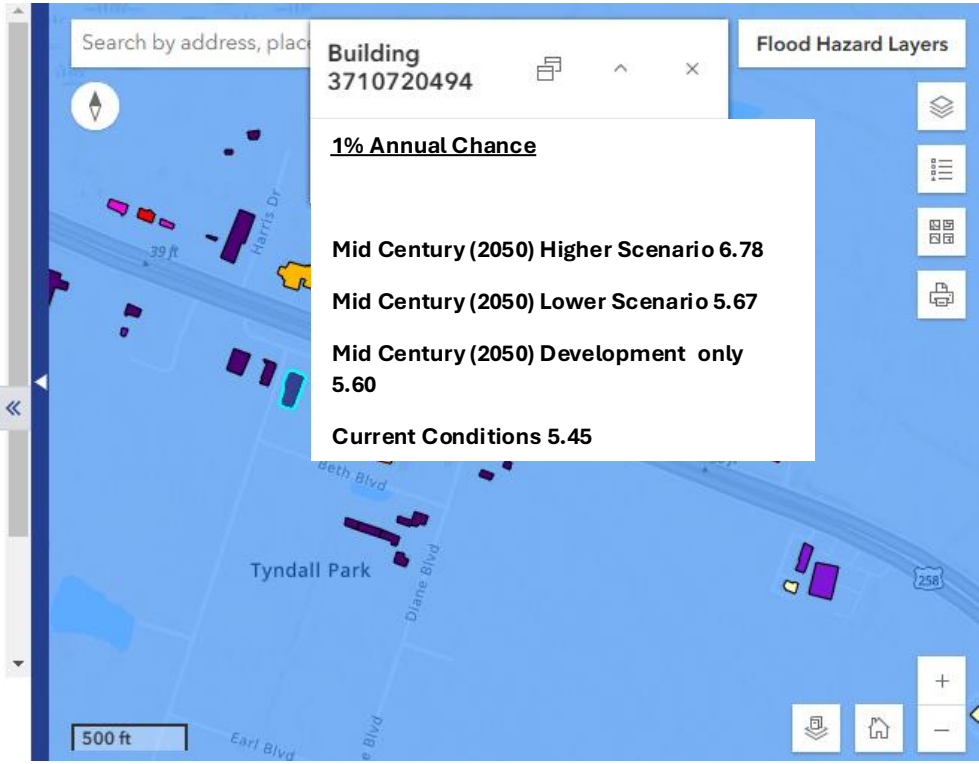

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Phase II – Tool Development

Tool Development and **Model Improvement**

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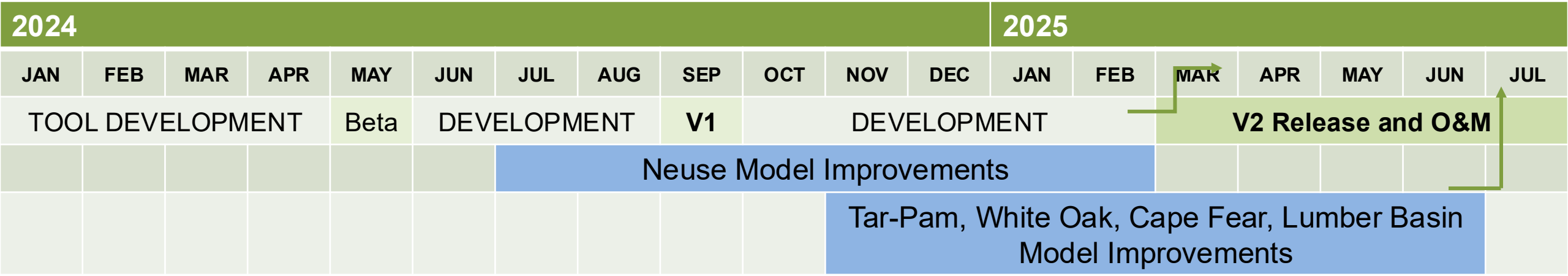
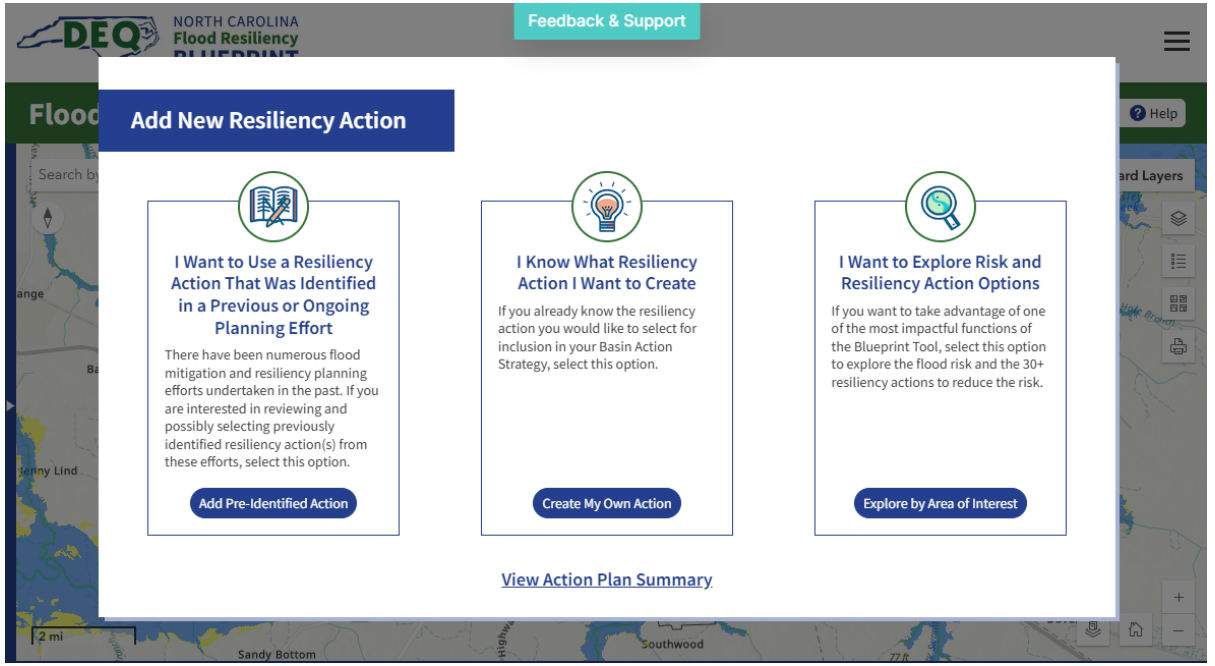


Blueprint Tool Feedback

Unclear goals, too expansive

Resilience Actions

- Categories are not intuitive
- Why are we spending time on ____?
- In the tool methodologies are either not functional or the underlying logic driving the methodology is not apparent



Phase II – Decision Support Tool

- (Original) Goals:
  - Be a resource for riverine and stream management to reduce flooding
  - Reduce the cost and complexity for local government in the planning and implementation of flood risk reduction projects
  - Lead to a prioritized set of projects

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Blueprint Tool

- Goals:
  - Be a resource for communities, local governments, and other partners for the planning and implementation of resilience actions (that reduces the burden for local governments)
    - Provide users with accurate, data-driven flood risk and vulnerability assessments
    - Allow users to explore, develop, and define flood resilience actions
    - Allow users to evaluate and prioritize a set of cost-effective flood resilience actions – Local Action Plans

  - Be a resource to DEQ and partners in the development of River Basin Action Strategies.
  - Support DEQ/State funding decisions for planning and implementation.

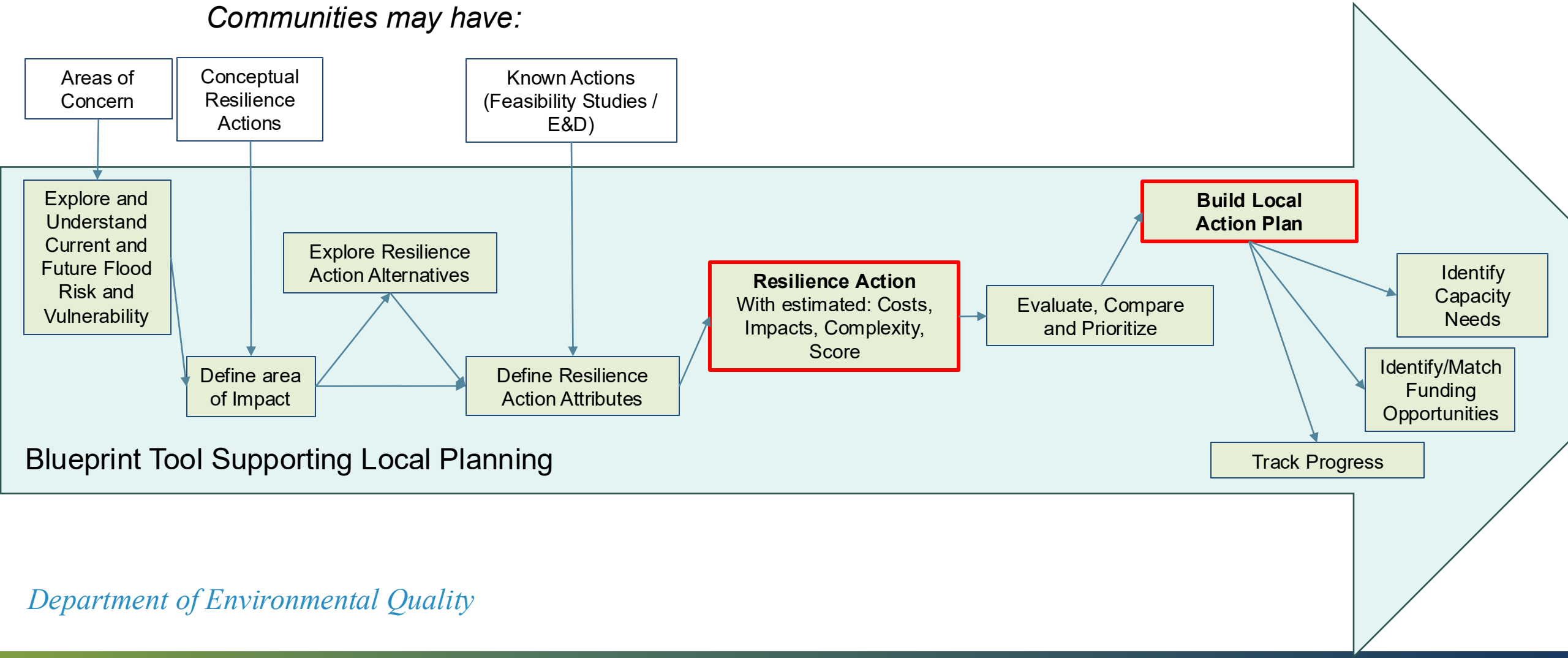
Blueprint Tool

Vulnerability Assessment	• Develop a Detailed Community Profile • Explore Flood Risk • Estimating Impacts of Flooding on People, Environment, Infrastructure, and Economic Sustainability • Flood Risk Scores
Explore, develop, and define flood resilience actions	• Develop New Resilience Actions (Resilience Action Methodologies) • Explore Flood Risk
Evaluate and prioritize a set of cost-effective flood resilience actions	• Build a local Action Plan • Project Complexity • Ranking Actions • Flood Risk Scores
Be a resource to DEQ/State in the development of River Basin Action Strategies, and funding decisions for planning and implementation.	• Action Management (internal) • Fund Matching Tool • Community Capacity • Data Repository • Flood Risk Scores

Phase II – Decision Support Tool

Local Planning Process

Communities may have:



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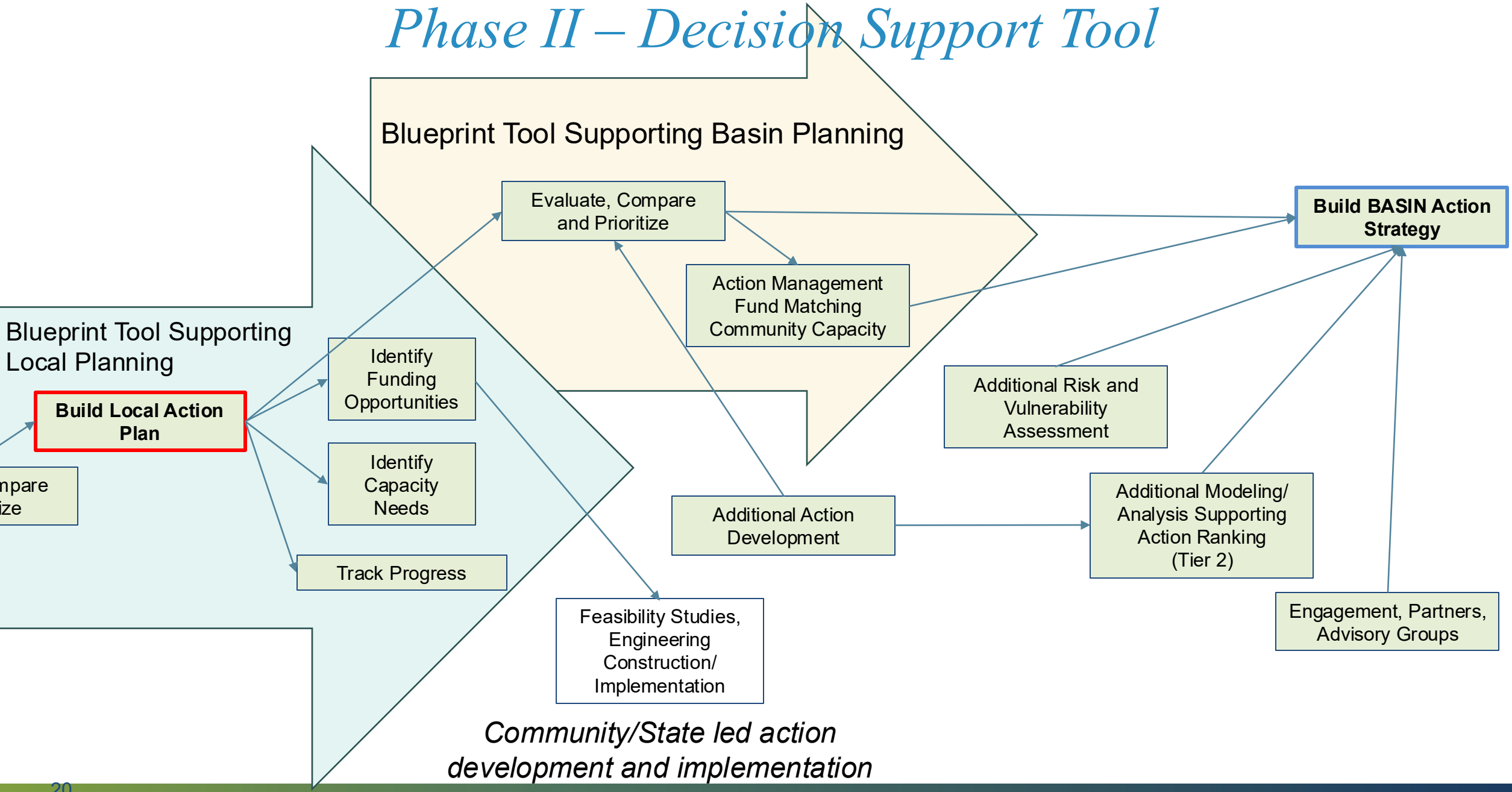
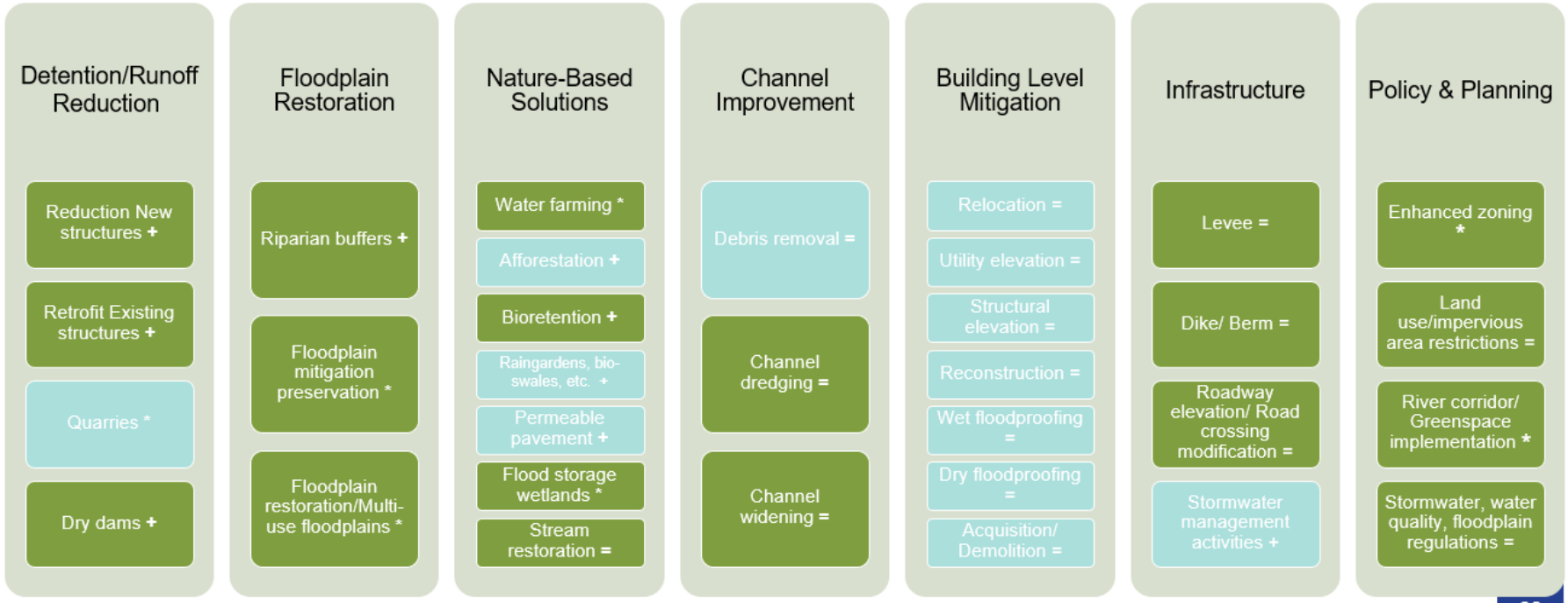
Phase II – Decision Support Tool



Blueprint Tool Feedback

Feedback on Resilience Actions

- Categories are not intuitive
- Why are we spending time on methodologies for rare, ineffective, or problematic mitigation measures?
- In the tool methodologies are either not functional or the underlying logic driving the methodology is not apparent



Phase II – Resilience Action Methodologies

Building Level Mitigation

- Relocation
- Utility Elevation
- Structural Elevation
- Reconstruction
- Wet Floodproofing
- Dry Floodproofing
- Critical Infrastructure
- Acquisition/Demolition

Channel Modifications

- Debris Removal
- Channel Dredging, Widening, Diversion

Nature Based Solutions

- Water Farming
- Bioretention
- Raingardens/Sand Filters/Bio-Swales
- Green Roofs
- Living Shorelines
- Permeable Pavement
- Afforestation
- Flood Storage Wetlands
- Floodplain Restoration
- Riparian Buffers
- Floodplain Preservation

Infrastructure and Control Structures

- Levee/Dike/Berm
- Dams
- Roadway Elevation/Road Crossing Modification
- Storm Water Management Activities
- Quarries

Other

- Beaver Management
- Coastal Resiliency Action

Policy and Planning

- Enhanced Zoning
- Land Use/Impervious Area Restrictions
- Multi-use Floodplains
- Stormwater, Water Quality, Floodplain Regulations

Blueprint Tool

Methodology Workgroup Meeting – January TBD

Categories	Flood Risk Reduction Measures	Categories	Flood Risk Reduction Measures
Building Level Mitigation	Relocation	Infrastructure & Control Structures	Levee/Dike/Berm
	Utility Elevation		Dams – Existing Structures, New Structures
	Structural Elevation		Roadway Elevation/Road Crossing Modification
	Reconstruction		Storm Water Management Activities
	Wet Floodproofing		Quarries
	Dry Floodproofing	Other	Beaver Management
	Critical Infrastructure		Coastal Resiliency Action
	Acquisition/Demolition	Policy & Planning	Enhanced Zoning
Channel Modification	Debris Removal		Land Use/Impervious Area Restrictions
	Channel Dredging, Widening, Diversion		Multi-use Floodplains
Nature Based Solutions	Water Farming		Stormwater, Water Quality, Floodplain Regulations
	Bioretention	Tool Methodologies	Funding
	Raingardens/Sand Filters/Bio-Swales		Community Capacity
	Green Roofs		Project Complexity
	Living Shorelines		Flood Risk Scores
	Permeable Pavement		Ranking Actions
	Afforestation		Estimating Impacts to…….
	Flood Storage Wetlands		
	Floodplain Restoration		
	Riparian Buffers		
	Floodplain Preservation		

Phase III - Process and Schedule

Overview

- Implementation
- Phase I (2022 - 2024) Complete
  - Research and evaluation, gap analysis, recommendations and decisions (Programmatic, Policy, Tools, Approaches, Needs),
  - Neuse River Basin Action Strategy (Pilot)
  - Draft Blueprint
- Phase II (2023 - 2025) - Ongoing
  - Model improvement
  - Develop online decision support tool (Blueprint Tool)
- **Phase III (2024 - 2025) - Ongoing**
  - **Develop RBAS for five prioritized areas**
  - Refine Blueprint and Neuse RBAS (including additional data)
  - Refine Decision Support Tool
  - Additional River Basin Action Strategies as funding allows

Phase 3 Process and Schedule

- Develop River Basin Action Strategies for Five Priority Basins – or as funding allows
  - Cape Fear, French Broad*, Lumber, Tar Pamlico, White Oak
- Complete the Neuse River Basin Action Strategy

- River Basin Action Strategy Timeline (Cape Fear, Lumber, Tar Pamlico, White Oak)
  - Contracts Awarded 10/28/24
  - Kick-off Meeting 11/4/24
  - Initial SOWs Approved **12/18**
    - Cape Fear, White Oak, Lumber, Tar-Pamlico,
  - **Draft RBAS for 12/1/2025**
  - **Final RBAS for 1/31/2026**

Phase III – River Basin Action Strategies
DRAFT

	Item	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26
MODELING	Neuse Modeling														
	Cape Fear Modeling														
	Lumber Modeling														
	Tar Pamlico Modeling														
	White Oak Modeling														
	LIDAR collection/processing														
	French Broad Modeling														
	End of Year report														
RIVER BASIN ACTION STRATEGIES	French Broad RBAS (Phase 1)														
	French Broad RBAS (Phase 2)														→→→
	Neuse River RBAS (Phase 2)														
	Cape Fear RBAS														
	Lumber RBAS														
	Tar Pamlico RBAS														
	White Oak RBAS														

Phase 3 Process and Schedule

- 6.4 Draft Basin Priority Resilience Actions - Initial Vetting
  - An annotated list of priority flood resilience actions for the basin based on information gathered initial data collection (1.1-1.3), initial community engagement.
  - Actions should be prioritized using best professional judgement and based on criteria developed for the blueprint rankings and should consider the likelihood of adverse impacts.

- Projects evaluated based on
  - their ability to reduce risk to human life
  - their ability to reduce flood impact to critical community infrastructure (e.g. emergency facilities, evacuation routes, and utilities)
  - their ability to reduce flood damage to other infrastructure, homes, businesses, etc.,
  - whether the projects had been identified in a Hazard Mitigation or other Resilience Planning efforts,
  - whether the projects are in a high-risk area,
  - their likelihood of reducing flood risk to, or improving flood resilience for, underserved communities,
  - whether the projects serve additional public benefit (e.g. parks, trails, schools, critical infrastructure, etc).

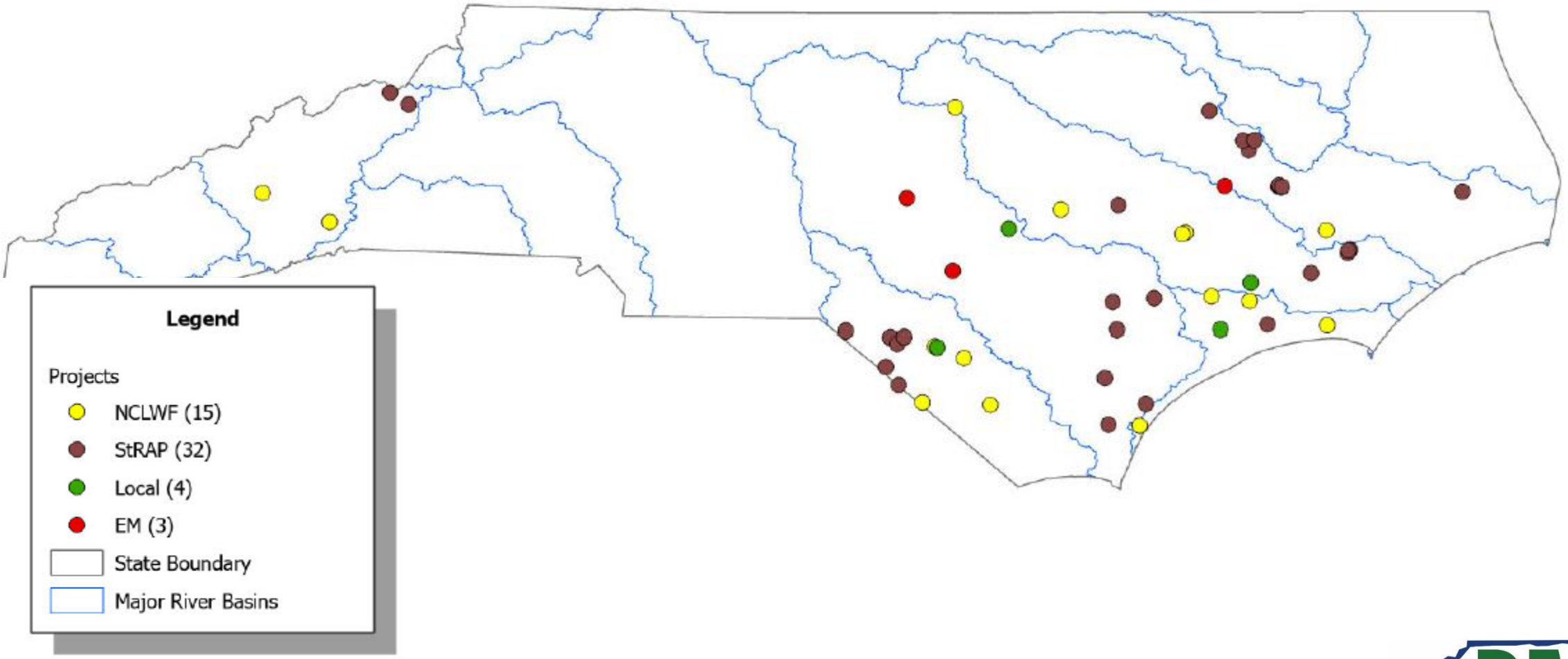
Blueprint - Implementation Strategy

Implementation Strategy – Committed Funds

Partner / Source	Amount	Individual Projects
Department of Agriculture - StRAP 2023	$ 4,721,991.00	**32**
Department of Natural and Cultural Resources – Land Water Fund (21-23)	$ 9,047,404.00	**15**
Direct Funding Local Gov	$ 3,679,476.00	**4**
NC Emergency Management - 2023 Disaster Relief and Mitigation Fund	$ 3,910,000.00	**3**
3% Administration	$ 2,880,000.00	
Out-the Door and Committed **Total**	**$ 24,238,871.00**	

Partner / Source	Amount	Individual Projects
Department of Agriculture - Farm Pond Pilot	$ 10,000,000.00	**?**
ommitted, but estimated total	**$ 10,000,000.00**	**?**

Implementation Strategy – Committed Funds



Implementation Strategy

Projects evaluated based on

- their ability to reduce risk to human life
- their ability to reduce flood impact to critical community infrastructure (e.g. emergency facilities, evacuation routes, and utilities)
- their ability to reduce flood damage to other infrastructure, homes, businesses, etc.,
- whether the projects had been identified in a Hazard Mitigation or other Resilience Planning efforts,
- whether the projects are in a high-risk area,
- their likelihood of reducing flood risk to underserved communities,
- whether the projects serve additional public benefit (e.g. parks, trails, etc).
- …no regrets

Possible Implementation Strategy

Partnering with Existing Programs

- NCDCM - Resilient Coastal Communities
- NCDEQ - Water Resources Development Grants programs
- NCORR – Community Development
- DNCR- Land Water Fund New Solicitation 24-25

Possible Implementation Strategy

Resilient Recovery Opportunities

Identify opportunities to provide incremental funding that leads to more resilient recovery

- DOT Resilient Recovery
  - Coordinating w/ DOT. Upsizing stream crossings, improving/hardening infrastructure
- Direct French Broad Opportunities
  - Projects that meet Blueprint Criteria

Possible Implementation Strategy

DEQ Direct Funding

- Direct Funding to Local Government
  - Unfunded BRIC proposals
- High Hazard Dams
- NCDEQ - NIFMP project
- Direct RFP
- USACE Matching Funds

Future of Blueprint

Department of Environmental Quality

Future of Blueprint - Vision

- Planning
  - Permanent staff, consistent funding for:
    - A Statewide Flood Resiliency Blueprint (all basins and a statewide action strategy)
    - Direct support for local governments
      - Local planning process / Project development
      - Blueprint Tool Support/Training
      - Capacity Support – marshalling funds, administering projects
    - Adaptive Management
      - Ongoing model and tool improvements, documentation, third-party review
      - Cyclical RBAS Updates

Future of Blueprint - Vision

- Implementation
  - Ongoing funding to ‘fill gaps’ and incentivize flood resilience
    - Project management, grant administration
    - Long-term maintenance, monitoring, and stewardship of implemented projects

Thank You

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